CLAIMS

1. A method of designing/configuring a multivariate statistical process monitor by a partial least squares approach comprises constructing from reference data of the process predictor and response matrices, the predictor matrix being comprised of signals of the manipulated and measured disturbance or cause variables of the process (predictor variables), and the response matrix being comprised of the controlled or effect variables of the process (response variables), decomposing the predictor and response matrices into rank one component matrices, each of said component matrices being comprised of a vector product in which one vector (the score vector) describes the variation and the other (the loading vector) the contribution of the score vector to the predictor or response matrix, decomposition being performed by the creation of a parametric regression matrix based upon iterations of the decomposition of the predictor and response matrices, characterised by the creation of a first generalised score vector which describes any significant variation of the process including variations of the predictor and response variables, and a second generalised score vector which represents the prediction error of the partial least squares model and residuals of the predictor matrix.

2. A method of designing/configuring a multivariate process monitor as claimed in claim 1 in which the generalised scores are calculated by constructing an augmented matrix, denoted here by Z and of the form

$$\mathbf{Z} = [\mathbf{Y} : \mathbf{X}],$$

where $\mathbf{X}$ is the predictor matrix and $\mathbf{Y}$ is the response matrix, and constructing a score matrix $\mathbf{T}_n = \mathbf{T}_n^* - \mathbf{E}_n^*$ in which $\mathbf{T}_n^*$ and $\mathbf{E}_n^*$ are generally of the form:

$$\mathbf{T}_n^* = [\mathbf{Y}:\mathbf{X}]\left[\mathbf{B}_{PLS}^{(n)}:\Im\right]^{\perp}\mathbf{R}_n$$

$$\mathbf{E}_n^* = [\mathbf{E}_n:\mathbf{F}_n]\left[\mathbf{B}_{PLS}^{(n)}:\Im\right]^{\perp}\mathbf{R}_n$$

the columns of the matrix $\mathbf{T}_n^*$ providing the generalised t-scores and the columns of the matrix $\mathbf{E}_n^*$ the generalised residual scores, where $\Im$ denotes an MxM identity matrix,

$\mathbf{B}_{PLS}^{(n)}$ is the PLS regression matrix.

3. A multivariate statistical process monitor which has been designed/configured by the method of claim 1 or claim 2 and which is so arranged as to identify abnormal process behaviour by analysing the residuals of the response variables.

4. A method of monitoring a process which comprises configuring a multivariate statistical process monitor by the method of claim 1 or claim 2, and identifying abnormal process behaviour, at least in part, by analysing the residuals of the response variables.